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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/759,312	01/12/2001	Yoshihiro Ueta	299002051800	1784
25226	7590	06/29/2004	EXAMINER	
MORRISON & FOERSTER LLP			MULPURI, SAVITRI	
755 PAGE MILL RD			ART UNIT	
PALO ALTO, CA 94304-1018			PAPER NUMBER	

2812

DATE MAILED: 06/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/759,312	UETA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Savitri Mulpuri	2812	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE \_\_\_\_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on RCE filed on 6/18/04.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 3-18 is/are pending in the application.
- 4a) Of the above claim(s) 8-11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-7 and 12-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. ____.  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>6/18/04</u> .   | 6) <input type="checkbox"/> Other: ____.                                    |

**DETAILED ACTION*****Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114.

Applicant's submission filed on 6/18/04 has been entered.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1,3-7,12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura et al (US 6,201,823) in combination with Zauner et al (publication by material research society).

Kimura et al discloses a compound semiconductor light emitting device having semiconductor multilayer structure on a sapphire substrate, wherein multilayer structure comprises acceptor doping layer and evenly formed of multi quantum well active layer '107" with several period of alternating quantum well and barrier layers of GaInN formed on a n-AlGaIn cladding layer "105" and n-

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GaN guide layer "106". Kimura further discloses magnesium doped p-AlGaN cladding layer "108" and magnesium doped p-type GaN optical guide layer "109" (see background invention). Kimura et al discloses in the background invention, even layers of multiple layers of GaN are formed on flat surface of the sapphire substrate (see fig.1 and fig.2 and related description).

Kimura do not discloses the starting substrate is GaN having tilted crystal orientation from  $\langle 0001 \rangle$  direction by angle which is equal to or greater than about 0.5 and less than or equal to 2 degrees. Inherently the active layer is formed from the substrate by a distance greater than or equal to one micron.

Zauner et al teaches growing GaN layer on GaN substrate as a homo-epitaxial growth at tilted angle of 0.2, 4 degrees to obtain GaN layers with two orders of magnitude reduction in density of grown hillocks as compared to homo-epitaxial films grown on  $\langle 0001 \rangle$  direction or hetero-epitaxial growth such as GaN on the sapphire substrate. Zauner particularly teaches obtaining smoother layers due to suppression of formation of hexagonal pyramids of GaN growth because GaN is grown on GaN substrate with off-angle orientation from  $\langle 0001 \rangle$  direction (see abstract and the introduction section). Zauner et al compared the results GaN grown on GaN substrate off-oriented from  $\langle 0001 \rangle$  direction with GaN grown on GaN substrate with  $\langle 0001 \rangle$  orientation and hetero-epitaxial growth such as GaN grown on sapphire substrate with  $\langle 0001 \rangle$  orientation (see results and discussion). Zauner teaches the substrate is (000-1) or (0001) plane, which supports newly amended claim limitation of substrate

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having (0001)(see introduction section, lines 8-11). It would have been obvious to one of ordinary skill in the art to replace sapphire substrate with GaN substrate having off-orientation from <0001> direction for the benefit of obtaining smoother layers less density of grown hillocks by two orders of magnitude compared to homo-epitaxial growth of GaN on GaN with <0001> direction and hetero epitaxial growth of GaN on sapphire <0001> direction. Modified invention of Kimura, as modified by the teaching of Zauner, would have active layer with surface roughness which is equal to or less than a thickness of well layer in the quantum well structure because same technique of homoepitaxial growth of GaN would be grown on GaN substrate with tilt angle of 0, 2, 4 degrees tilted away from <0001> direction to <11-20> or <1-100>.

### ***Response to Arguments***

Applicant's arguments filed on 6/18/04 have been fully considered but they are not persuasive. Applicant argues that neither Kimura nor Saunter teach nitride compound semiconductor light emitting device as presently claimed especially amended limitation of "a nitride compound semiconductor light emitting device including "a GaN substrate having (0001) plane whose crystal orientation is tilted away from a <0001> direction by an angle which is equal to or greater than about 0.05 degrees and which is equal to or less than about 2 degrees" and device having multilayer structure an acceptor doping layer and an active layer. Kimura discloses forming GaN light emitting device with multilayer structure with p- dopant of magnesium. Zauner discloses GaN layer grown on

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GaN substrate, where GaN substrate is either (000-1) or (0001) plane, wherein GaN (000-1) plane results smoother surface compared to (0001) plane.

Applicant argues that the (0001) plane is substantially different in structure and result from the (000-1) surface of GaN substrate, wherein (0001) GaN substrate is terminated with Ga atoms, where as (000-1) GaN terminated with nitrogen atoms. However, Zauner also teaches the same explanation as argued by applicant that smooth epi-ready GaN substrate with (000-1) plane obtained by just mechanical polishing N-side of GaN crystals, where as epi-ready smooth GaN substrate (0001) plane obtained by mixed process of ion-etch and mechanical polishing Ga side of the GaN crystals (see introduction section, lines 8-11).

Conclusively, modified invention of Kimura would have GaN light emitting structure with multiple active layers and would be grown on (0001) plane GaN with tilted orientation for the benefit of reduced density of hillocks, as modified by the teaching of Zauner, and would have improving light emitting efficiency with low operation voltage and or current due to reduced density of hillocks.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Prior art cited in IDS filed on 6/18/04 was reviewed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Savitri Mulpuri whose telephone number is

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571-272-1677. The examiner can normally be reached on Mon-Fri from 8 to 4.30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling, can be reached on 571-272-1679. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Savitri Mulpuri  
Primary Examiner  
Art Unit 2812